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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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16. KEY

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2	1	Cog. Mgr. J.G. Kristofzski	LM Sasaki for JGK	5/15/95							
2	1	QA T.C. Trible	T.C. Trible	5/15/95							
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J. Jo Jaidwk Jo 5-15-95 Signature of EDT Originator Date	W. J. Kennedy [signature] 5-15-95 Authorized Representative for Receiving Organization Date	J. G. Kristofzski LM Sasaki for JGK 5/15/95 Cognizant Manager Date	[] Approved [] Approved w/comments [] Disapproved w/comments

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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

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Kara M. Broz

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Tank 241-A-102
Tank Characterization Plan

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

by

Los Alamos Technical Associates
8633 Gage Boulevard
Kennewick, Washington 99336

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LIST OF ABBREVIATIONS

A-102	Tank 241-A-102
A1 SLTCK	saltcake waste from 242-A Evaporator
A2 SLTSLRY	saltcake/slurry from the 242-A Evaporator
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DQO	data quality objective
DDSF	double-shell slurry feed
DST	double-shell tank
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	reduction-oxidation
SAP	Sampling and Analysis Plan
SST	single-shell tank
SRR	strontium recovery waste from B-Plant
TCP	Tank Characterization Plan
TOC	total organic carbon
TWRS	Tank Waste Remediation System
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the U.S. Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues (Conway 1993). The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process ... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information (Ecology et al. 1994)." This document satisfies that requirement for tank 241-A-102 (A-102) sampling activities.

2.0 DATA QUALITY OBJECTIVES APPLICABLE TO TANK 241-A-102

The sampling and analytical needs associated with the Hanford Site underground storage tanks on one or more of the four Watch Lists (ferrocyanide, organic, flammable gas, and high heat) and the safety screening of all 177 tanks have been identified through the DQO process. A DQO identifies the information needed by a program group concerned with safety issues, regulatory requirements, tank waste processing, or the transport of tank waste. As of January 31, 1995, tank A-102 was classified as a non-Watch List tank. The DQOs that have been completed and are applicable to tank A-102 are discussed in the following section.

2.1 SAFETY SCREENING DATA QUALITY OBJECTIVE

The *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994) describes the sampling and analytical requirements that are used to screen the waste tanks for unidentified safety issues. Both Watch List and non-Watch List tanks will be sampled and evaluated to classify waste tanks into one of three categories (SAFE, CONDITIONALLY SAFE, or UNSAFE). The safety screening DQO identifies the guidelines to determine to which category a tank belongs based on analyses that indicate if certain measurements are within established parameters. If a specified parameter is exceeded, further analysis of a second set of properties and a possible Watch List classification would be warranted. A tank can be removed from a Watch List if it is classified as SAFE.

The safety screening DQO requires that a vertical profile of the tank waste be obtained from at least two widely spaced risers. This vertical profile may be obtained using core, auger, or grab samples. The primary analytical requirements for the safety screening of a tank are energetics, total alpha activity, moisture content, and flammable gas concentration. These analyses shall be applied to all core samples, DST Resource Conservation and Recovery Act (RCRA) samples, and all auger samples, except those taken exclusively to assess the flammable gas crust burn issue.

3.0 TANK A-102 HISTORICAL INFORMATION

This section summarizes the available historical information on tank A-102. Included are the age of the tank, process history, and a discussion of any historical sampling events for the tank. The fill history information is available in *A History of the 200 Area Tank Farms* (Anderson 1990), and *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Area* (Brevick et al. 1994).

3.1 TANK CONFIGURATION

Single-shell tank A-102 was constructed between 1955 and 1956, and is located in the 200-East Area. Built with the fourth generation design for holding boiling or self concentrating waste, tank A-102 is 23 meters (75 feet) in diameter and has a capacity of 3,785,000 liters (1,000,000 gallons). The tank is second in a cascade flow series consisting of tanks 241-A-101, 241-A-102, and 241-A-103. A cascade flow system consists of tanks connected in series by pipes. When the primary tank in the system became full, the waste would then flow to the secondary tanks in the system.

The tank A-102 surface level is monitored quarterly with a Food Instrument Corporation gauge through riser #6. Liquid waste volume is determined by a photographic evaluation and the solid waste volume is determined with a food instrument gauge and a photographic evaluation.

3.2 AGE AND PROCESS HISTORY

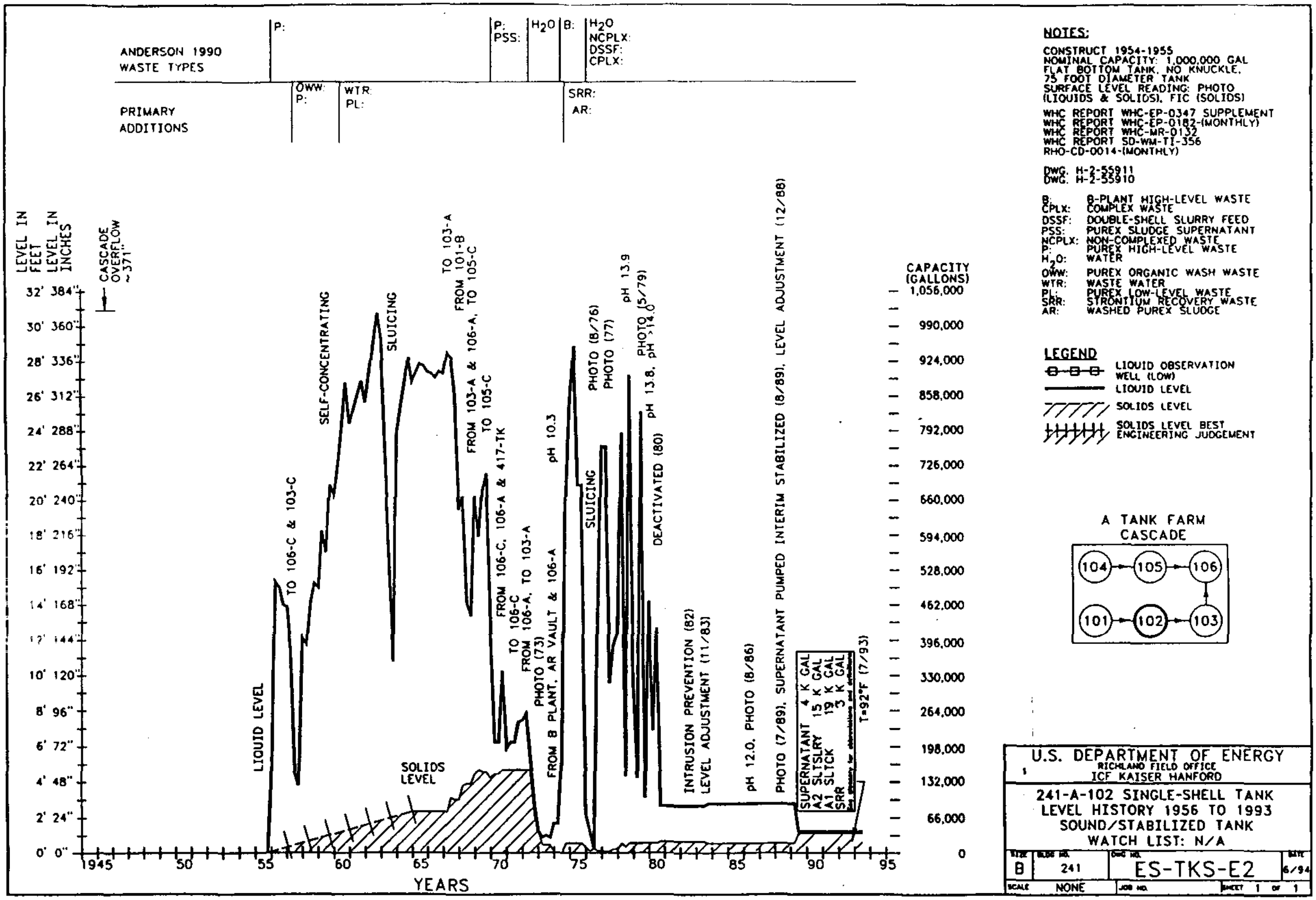
Tank A-102 was filled with plutonium-uranium extraction (PUREX) waste from the first quarter of 1956 until the third quarter of 1970. The tank was sluiced in 1964 for strontium and cesium removal. The tank received and contained PUREX sludge supernatant waste from the fourth quarter of 1970 until the fourth quarter of 1972. The tank was sluiced to reduce the sludge heel for saltcake storage from the fourth quarter of 1972 until February 1974. From the third quarter of 1974 until the first quarter of 1976, the tank received B Plant high-level waste and strontium recovery waste. The tank was sluiced to prepare for saltcake waste in the first two quarters of 1976 and it received evaporator feed until the first quarter of 1978. Non-complexed waste was sent to the tank during the second and third quarters of 1978, the fourth quarter of 1979, and the second and third quarter of 1980. The tank received complexed waste from B Plant during the first through third quarters of 1979. The tank contained double-shell slurry feed in the fourth quarter of 1978 and the first quarter of 1980.

The tank was declared deactivated in November 1980 and intrusion prevention was completed during 1982. The tank was interim stabilized in August 1989 after most of the supernatant was pumped. Figure 3-1 shows the supernatant and solids waste levels of tank A-102 from 1956 to the present (Anderson 1990, Agnew 1994a). Solids and supernatant levels were taken on a quarterly basis as part of the overall surveillance effort in the tank farms. The solids level in the tank is indicated by the shaded area and the supernatant level is indicated by the thick line above the shaded area.

3.3 HISTORICAL SAMPLING EVENTS

In May 1963, a chemical and radiochemical analysis was conducted on a sludge sample from tank A-102. The results from this analysis can be found in "Chemical and Radiochemical Analyses of TK-241-A-102 Sludge" (McKenzie 1963). Waste analysis for tank A-102 were also conducted in 1973 and 1975. The complete analysis results can be found in "Characterization of 102-A Sludge" (Dodd 1973) and "Analysis of Tank Farm Samples Sample: T-7252 102-A" (Wheeler 1975). A series of hot boildown samples were run in 1980. Results from these analyses can be found in "Hot Boildown of 102A Waste Liquor" (Jansky and Herting 1980) and "Hot Boildown of Tank 102A Waste" (Jansky 1980a). In December 1980, two samples were taken from tank A-102: one from a shallow sampling depth and one from a deep sampling depth. The samples were analyzed and the results indicated that the solids were primarily sodium nitrate and had approximately 30% by volume of crystalline solids. The deep sample had 15 wt% solids and the shallow sample had 9%. The complete results from these samples can be found in "Composition of Waste in Tank 102A" (Jansky 1980b). Four samples were analyzed in Fiscal Year 1986 to characterize the waste. The samples varied in color and texture. Results from these analyses can be found in *Data Transmittal Package for 241-A-102 Waste Tank Characterization* (Weiss and Schull 1988). The most recent data are from a sample of the supernatant liquid analyzed in May 1989. The tank has been found to contain organic carbon with a TOC concentration of 12.4 g/L. This concentration is below the criteria for inclusion on the Organic Watch List. The complete analysis results can be found in "Analysis of Liquid Sample from Tank 241-A-102" (Weiss 1989).

Figure 3-1: Fill History of Tank 241-A-102



4.0 CURRENT TANK STATUS

4.1 1995 TANK STATUS

Tank A-102 is identified as a low-heat load non-Watch List tank, that is passively ventilated and is categorized as sound with interim stabilization and partial interim isolation completed. As of January 31, 1995, the tank contained 155,000 liters (41,000 gallons) of DSSF waste. The waste was comprised of 117,000 liters (15,000 gallons) of sludge, 83,000 liters (22,000 gallons) of saltcake, and 15,000 liters (4,000 gallons) of supernatant (Hanlon 1995). This total volume of waste corresponded to a depth of 38 centimeters (15 inches).

4.2 EXPECTED TANK CONTENTS

Tank A-102 is expected to contain three primary layers: a bottom sludge layer comprised of strontium recovery waste, a layer of saltcake waste generated from the 242-A evaporator-crystallizer (A1 SLTCK) followed by a layer of salt slurry waste generated from the 242-A evaporator-crystallizer (A2 SLTSLRY) and DSSF supernatant. The photographs for A-102 taken in 1989 show a thin grey saltcake surface layer broken up with supernatant showing through. Because the photo was taken before the supernatant was pumped, it does not represent the current status of the tank. An estimated inventory based on the Tank Layer Model (Agnew 1994b) is shown in the Table 4-1. This estimate is based on 140,000 liters (37,000 gallons) of sludge and saltcake in the tank, and does not include the volume of liquid waste.

Table 4-1: Tank 241-A-102 Solids Composite Inventory Estimate

Physical Properties			
Total Solid Waste	Mass = 2.20E+05 kg; Volume = 140 kL (37 kgal)		
Heat Load	7.70E-01 kW (2.63E+03 BTU/hr)		
Bulk Density	1.57 (g/cm^3)		
Void Fraction	0.36		
Water wt%	13.43		
TOC wt% C (wet)	0.57		
Chemical Constituents	**moles/L**	**µg/g**	**kg**
Na^+	1.18E+01	1.73E+05	3.80E+04
Al^{+3}	7.80E-01	1.34E+04	2.96E+03
Fe^{+3} (total Fe)	6.65E-02	2.36E+03	5.20E+02
Cr^{+3}	5.61E-03	1.86E+02	4.10E+01
Ni^{+2}	1.43E-02	5.35E+02	1.18E+02
K^+	1.01E-02	2.51E+02	5.52E+01
OH^-	3.01E+00	3.26E+04	7.17E+03
NO_3^-	4.04E+00	1.60E+05	3.51E+04
NO_2^-	3.30E-01	9.52E+03	2.09E+03
CO_3^{-2}	4.80E-01	1.82E+04	3.99E+03
PO_4^{-3}	3.60E-01	2.16E+04	4.76E+03
SO_4^{-2}	2.11E+00	1.29E+05	2.84E+04
F^-	5.10E-01	6.17E+03	1.36E+03
Cl^-	1.96E-02	4.42E+02	9.73E+01
$C_6H_5O_7^{-3}$	2.64E-02	3.18E+03	7.00E+02
$EDTA^{-3}$	1.09E-02	2.01E+03	4.41E+02
$HEDTA^{-3}$	2.19E-02	3.82E+03	8.41E+02
glycolate$^-$	6.58E-02	3.14E+03	6.92E+02
acetate$^-$	3.07E-02	1.15E+03	2.54E+02
Radiological Constituents	**Ci/L**	**µCi/g**	**Ci**
Pu		1.70E-01	6.20E-01 (kg)
U	3.56E-02 (M)	5.39E+03 (µg/g)	1.19E+03 (kg)
Cs	3.30E-01	2.09E+02	4.59E+04
Sr	5.90E-01	3.75E+02	8.25E+04

5.0 STRATEGY FOR DATA QUALITY OBJECTIVE RESOLUTION

After a review of the historical information for tank A-102, it has been determined that it is necessary to sample the tank for general characterization needs following the relevant DQO. Tank A-102 contains solids which have not been characterized since the tank was supernatant pumped and interim stabilized.

Only one sampling event for tank A-102 is currently scheduled: an auger sample (Stanton 1995). The auger sampling method was chosen based on a waste depth of less than 20 inches and expected solid sample. Auger sampling is appropriate and should allow a full vertical profile to be obtained (See Section 4.1). The auger sampling shall be conducted following the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994). Sampling and analytical requirements from this DQO are summarized in Table 5-1. Complete lists of sampling and analytical requirements are given, as an appended attachment, in the appropriate Sampling and Analysis Plan (SAP).

Table 5-1: Integrated DQO Requirements

Sampling Event	Applicable DQOs	Sampling Requirements	Analytical Requirements
Auger	▸Safety Screening DQO	Auger samples from at least 2 risers separated radially to the maximum extent possible	▸Energetics ▸Moisture Content ▸Total Alpha

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